Building a Sustainable Future. Quo Vadis? Dr Daniela Ottmann will discuss the various socio-cultural, politico-econmomic and bio-climatic environments that will affect the future of architecture and urban design

Ottmann, Daniela

Building a sustainable future

QUO VADIS ?

PUBLIC LECTURE 17 MAY 2019

Where is it heading, this unprecedented urban experiment of ours on planet earth?

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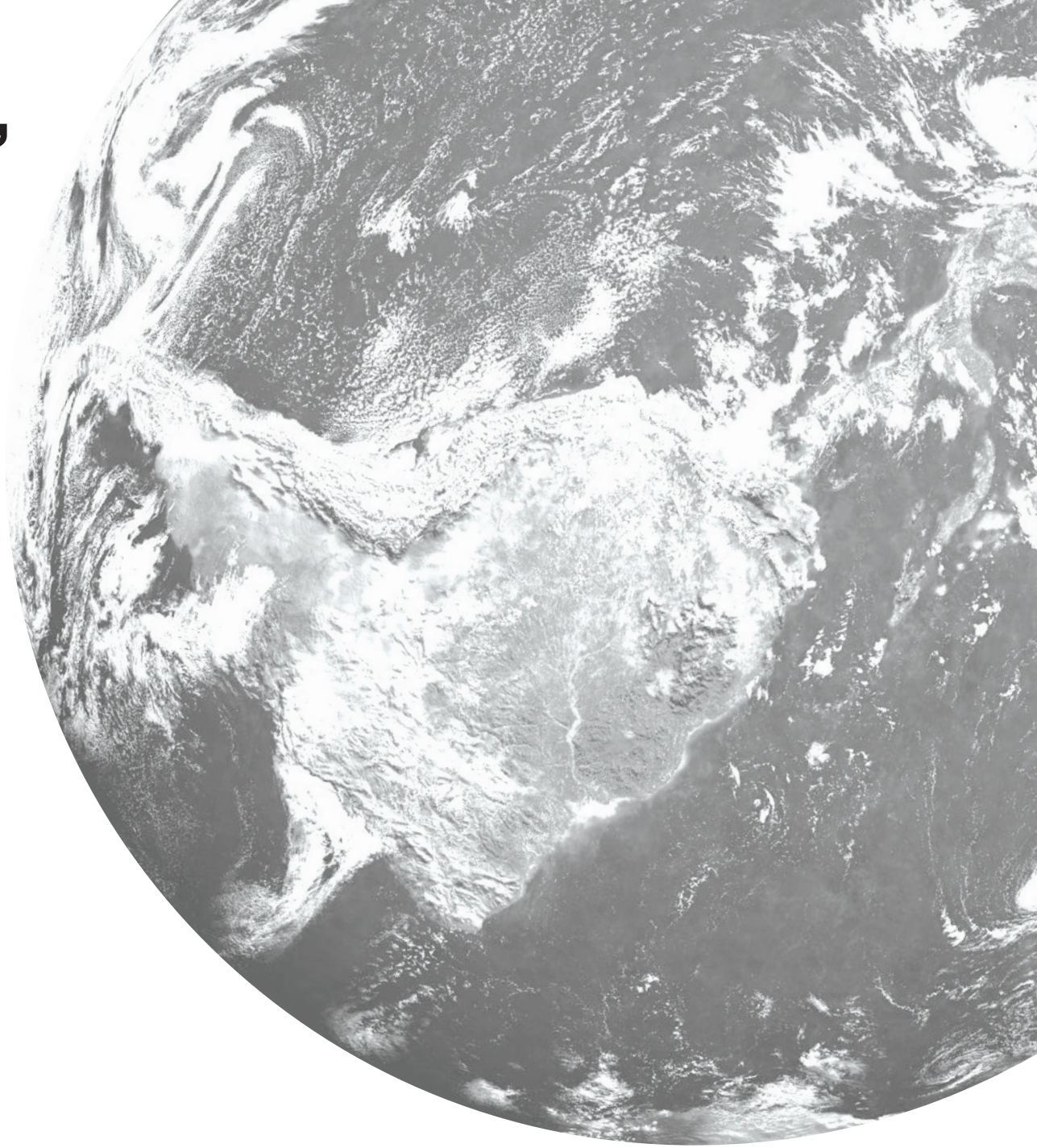
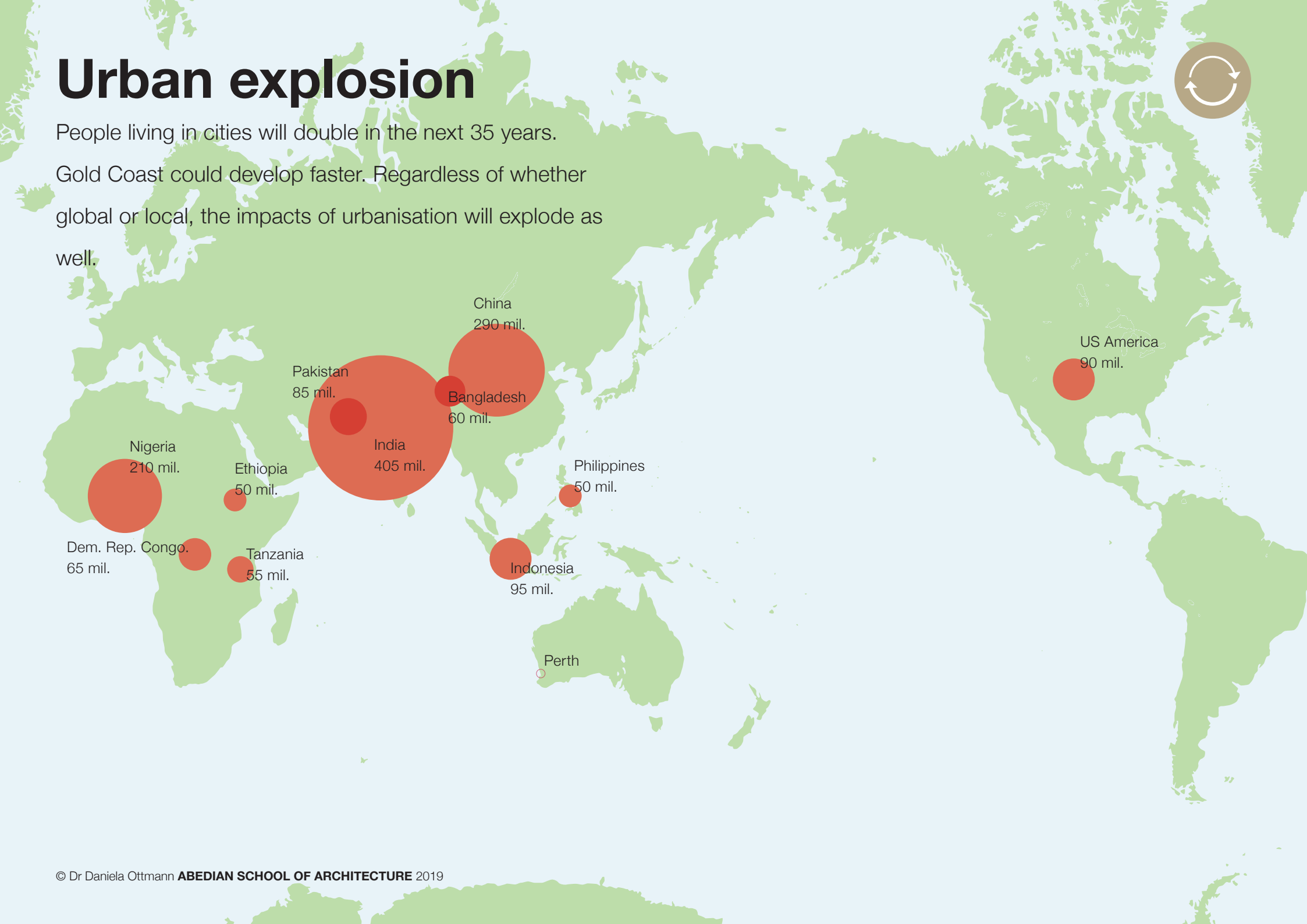


Urban explosion

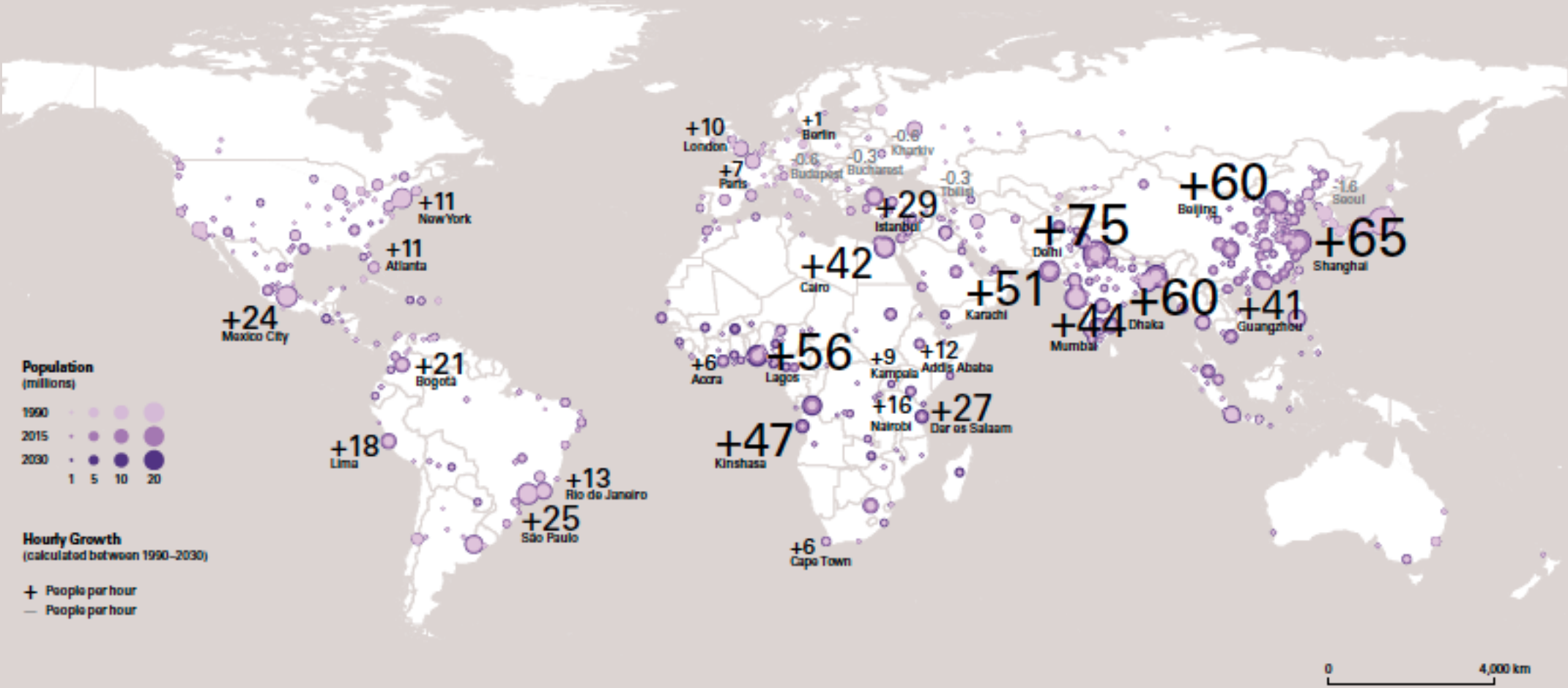
People living in cities will double in the next 35 years.

Gold Coast could develop faster. Regardless of whether global or local, the impacts of urbanisation will explode as well.



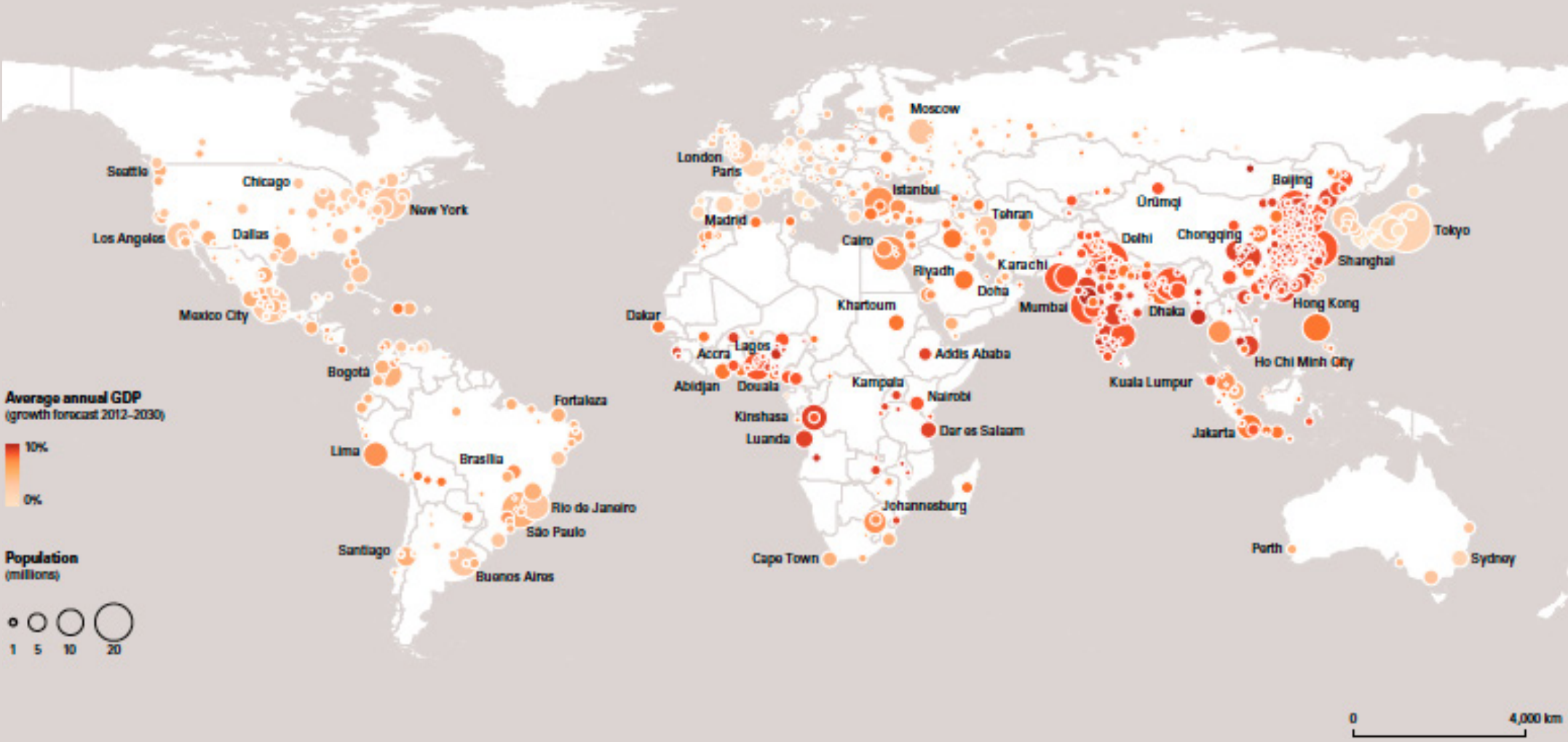
Urban dynamics

Where cities are growing



Economic growth

forecast 212-2030



Urban explosion

The Evolving Urban Form: Shanghai is one of the world's fastest growing megacities (urban regions of more than 10 million population). Shanghai's 6.6 million population growth equals the strong growth of the Manila urban region over the same period but trails the 7.4 million growth in the Jakarta urban region

Urban peripheries

The urbanisation challenge is now, first and foremost, a challenge for less-developed countries. An estimated 33 per cent of the projected increase in the world's urban population between 2015 and 2050 will be in cities in sub-Saharan Africa, for example.

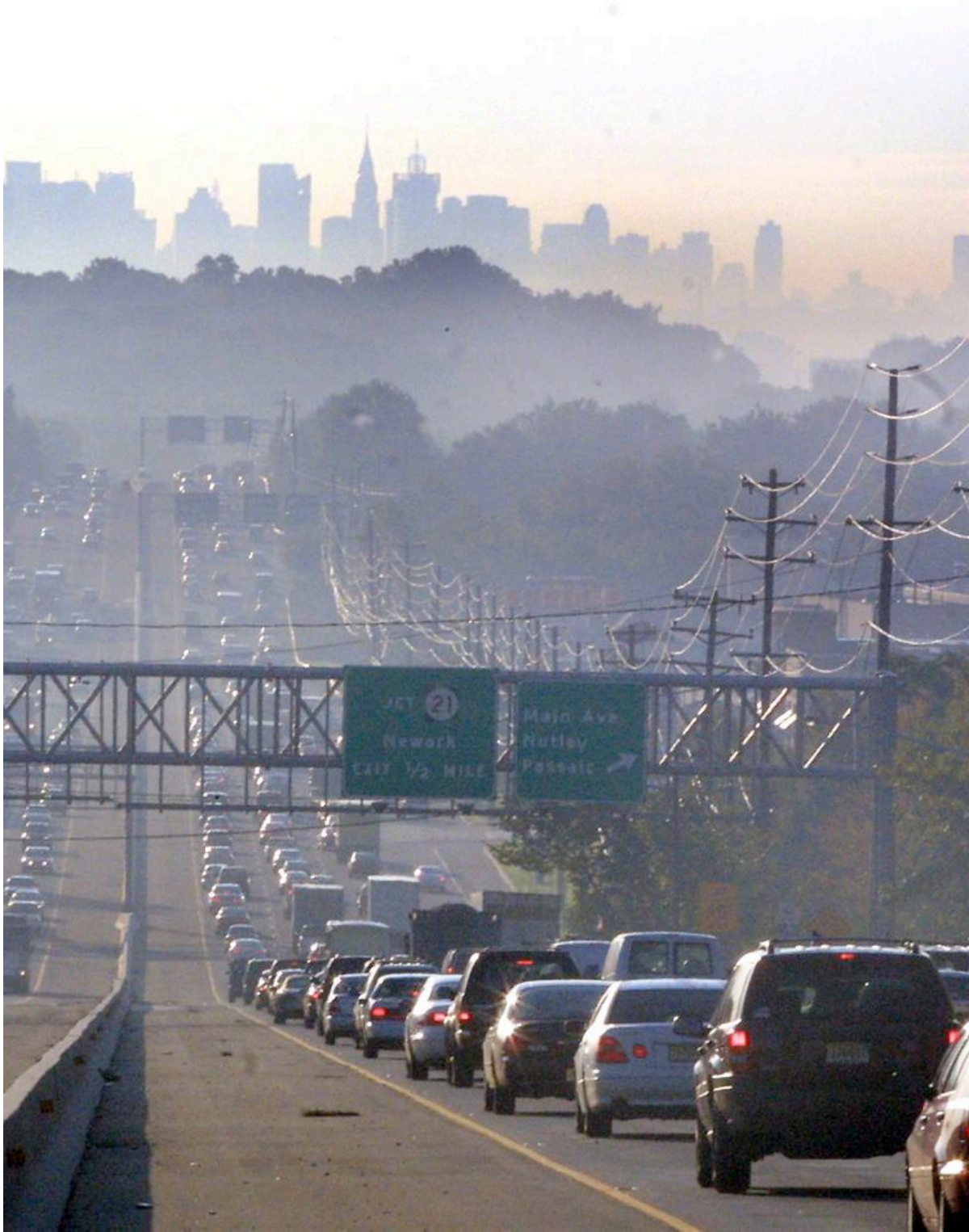
Lagos Island from Makoko: Over 1,000 people enter Lagos every day, many ending up in informal settlements like Makoko. Built on stilts, the de facto self-governing fishing village is also a significant source of cut timber. © Yann Arthus-Bertrand

Urban peripheries

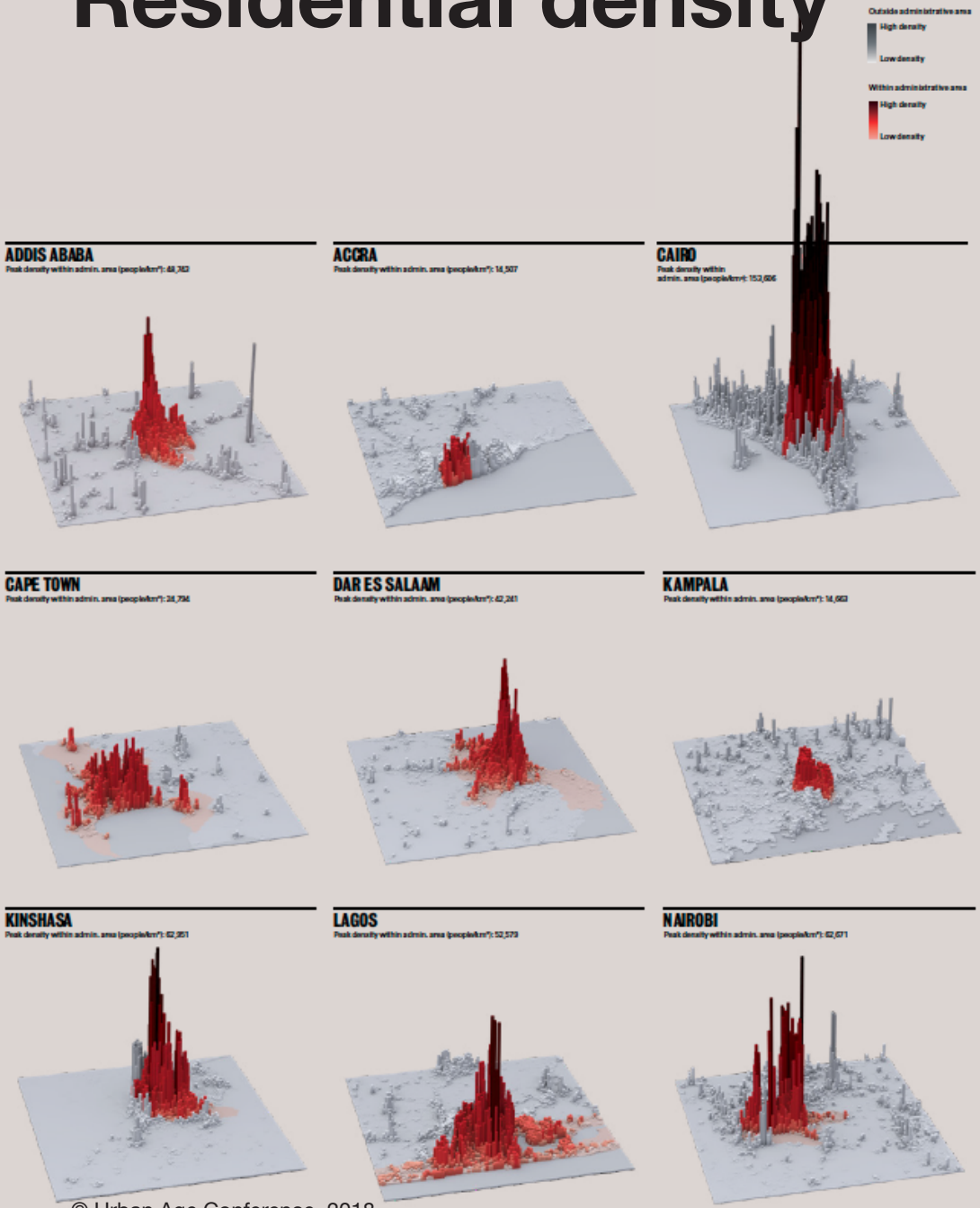
Focusing on urban form and the territorial organisation of cities, it needs to attend to several key issues:

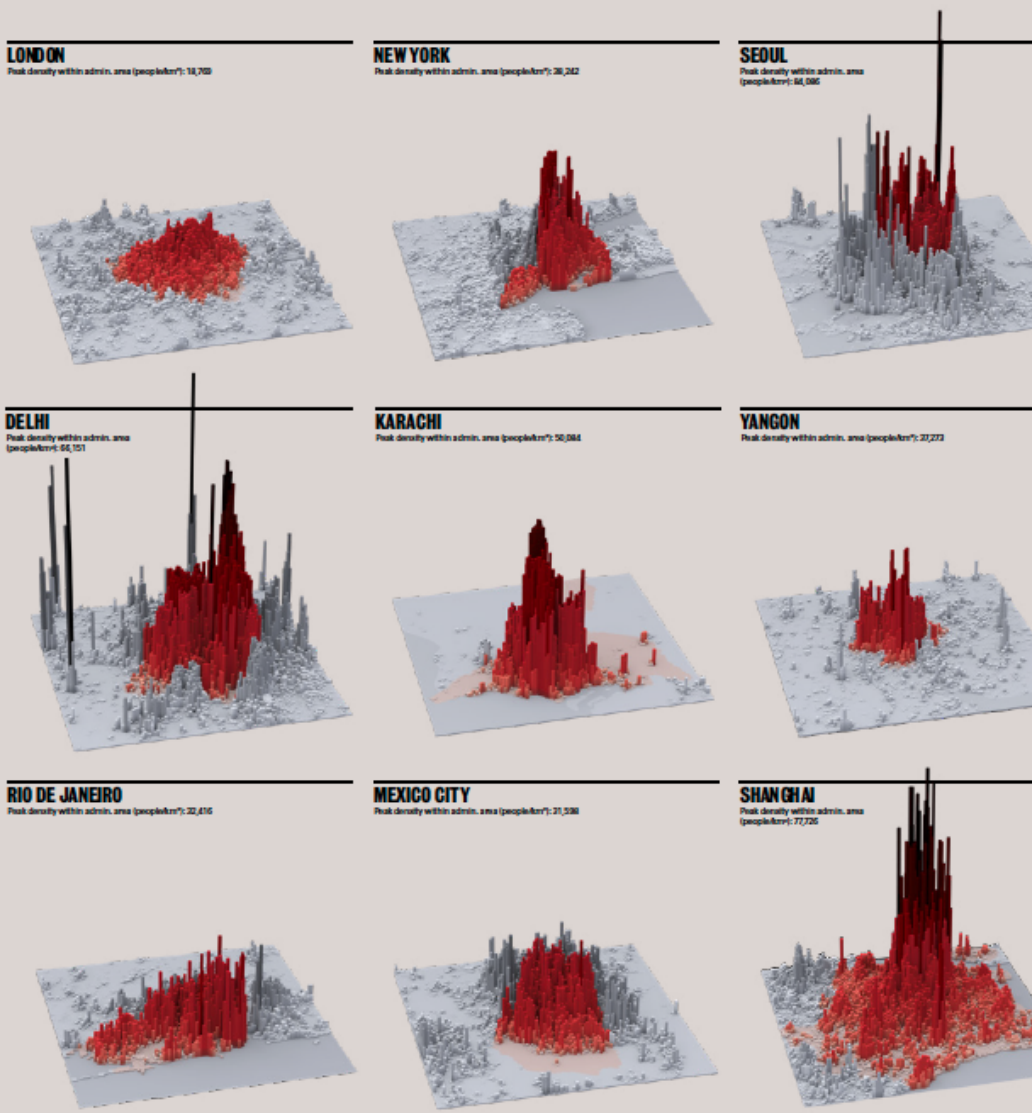
• Lower densities and incomplete arterial road networks make public transit less feasible, leading to higher energy use and higher greenhouse gas emissions.

• Cities with inadequate protection of open spaces – where urban development is not allowed – have smaller capacities



Residential density





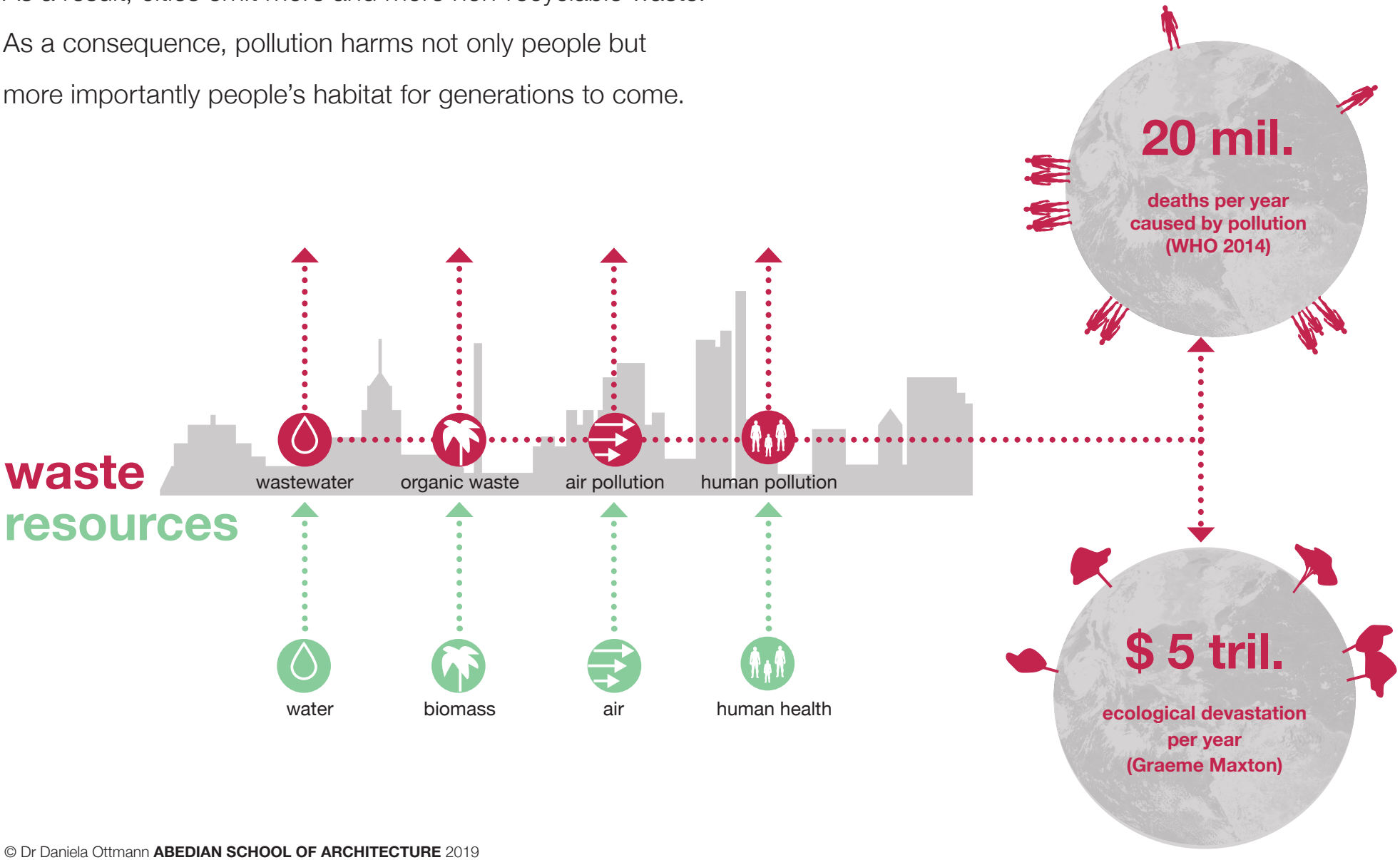
Fatal blast

Cities consume more and more water, biomass and air.

As a result, cities emit more and more non-recyclable waste.

As a consequence, pollution harms not only people but

more importantly people's habitat for generations to come.



Industrial metabolism: the revolution of comfort and waste

Industrial revolution

Fossil fuel driven urban metabolism

red: pollution affected urban functions and ecological resources

A threatened species: Homo S.

Up to 30% suffer from allergic diseases (1)

10% of population has diabetes (2)

7 mil per year death by air pollution (3)

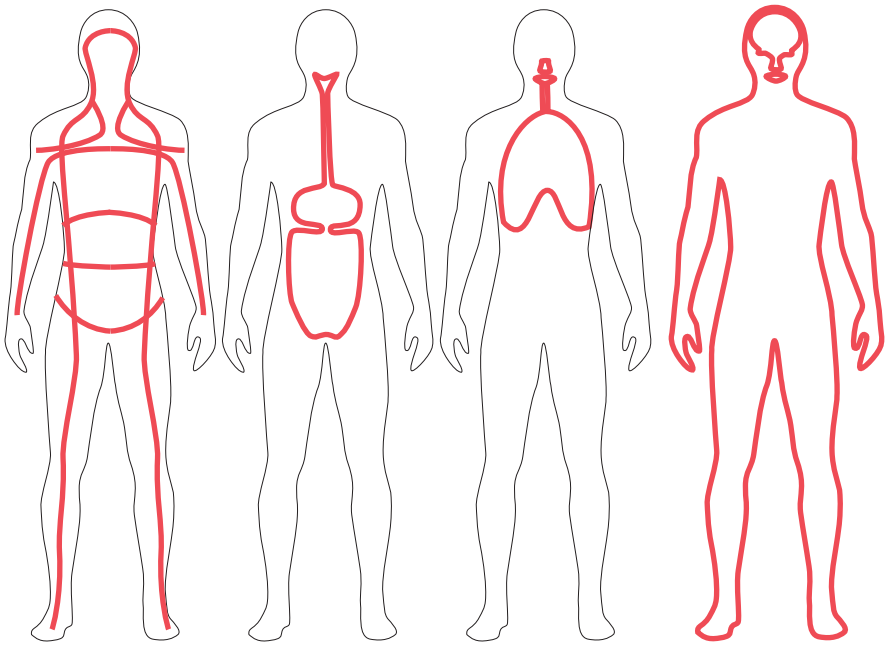
Up to 30% cancer risk by light pollution (4)

Up to 100% effect of synthetic chemicals (5)

37% of population limited fertility (6)

3.2 mil dead by physical inactivity (7)

40% with raised blood pressure (8)

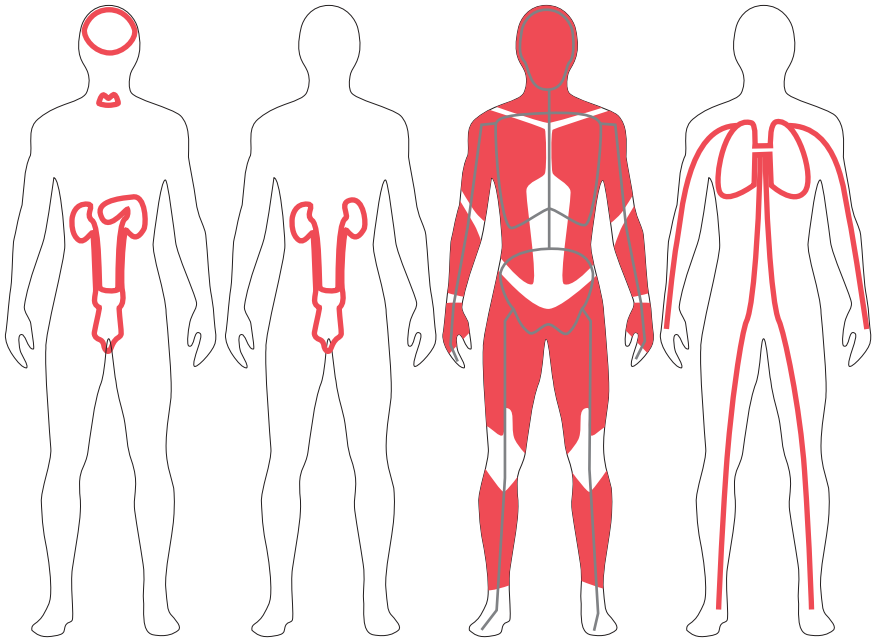


Immune System

Alimentary System

Respiratory System

Nerve-Sense System



Enocrine (Horm.) System

Genital System

Skeletal-Musculo System

Cardio System

Diseases in percent or total sum of entire population

(1) World Allergy Organisation: White Book on Allergy 2011-12, http://www.worldallergy.org/publications/wao_white_book.pdf

(2) UN World Health Statistics, http://apps.who.int/iris/bitstream/10665/82058/1/WHO_HIS_HSI_13.1_eng.pdf

(3) http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/

(4) Bild der Wissenschaft, www.wissenschaft.de/sixcms/detail.php?id=236607

(5) United Nations Report, http://www.who.int/mediacentre/news/releases/2013/hormone_disrupting_20130219/en/

(6) Psychology Today, http://www.psychologytoday.com/blog/how-we-do-it/201305/sperm-counts-updated

(7) World Health Organisation, http://www.who.int/whr/2002/en/

(8) World Health Organisation, http://www.who.int/gho/ncd/risk_factors/blood_pressure_prevalence/en/

Urban metabolism: entrails

transmission:

water

sewage

waste

goods

transport

power

communication

security:

safety

defence

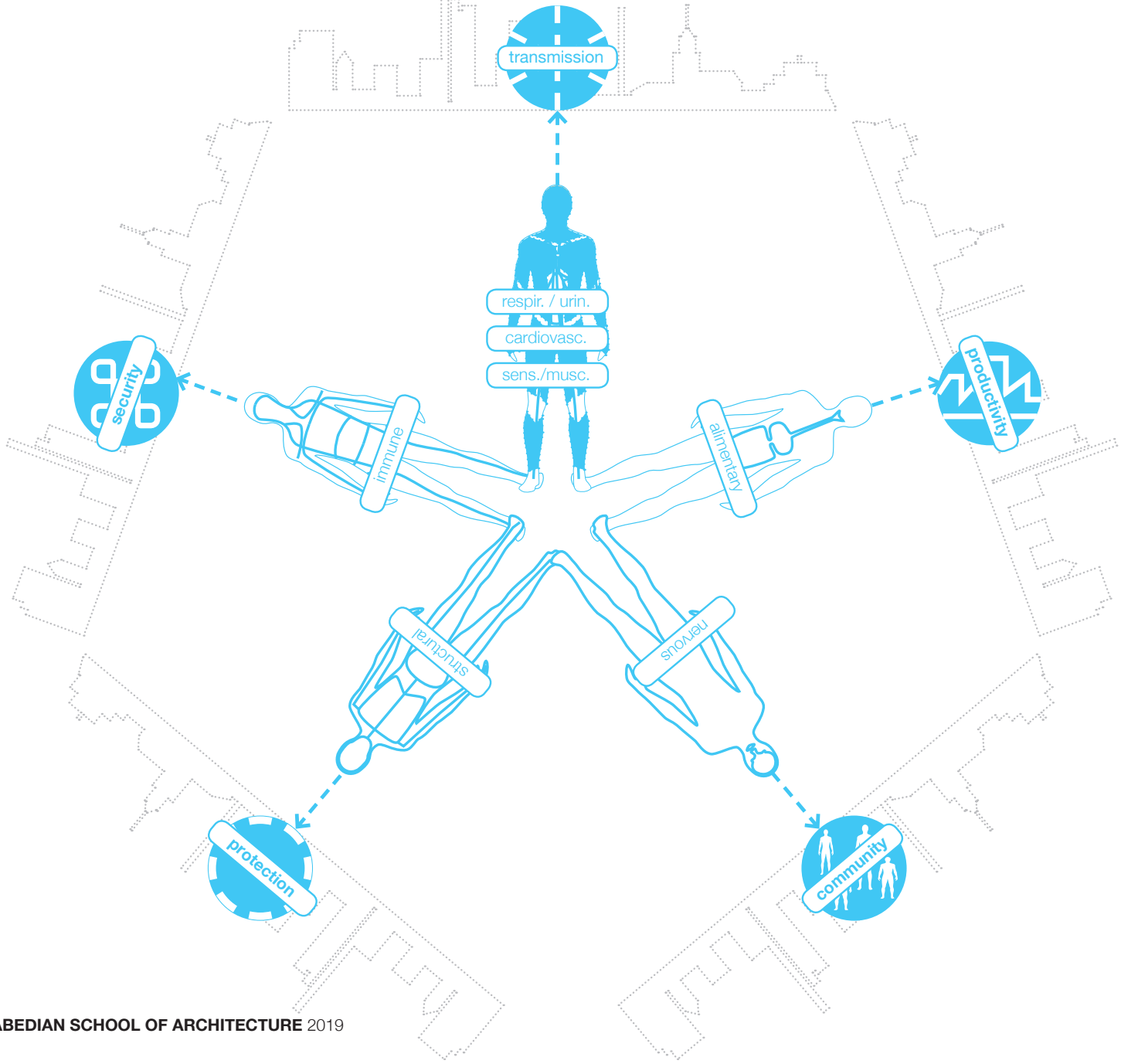
health

protection:

space

skeleton

skin



productivity:

industry

commerce

retail

aquaculture

agriculture

forestry

community:

culture

spirituality

education

research

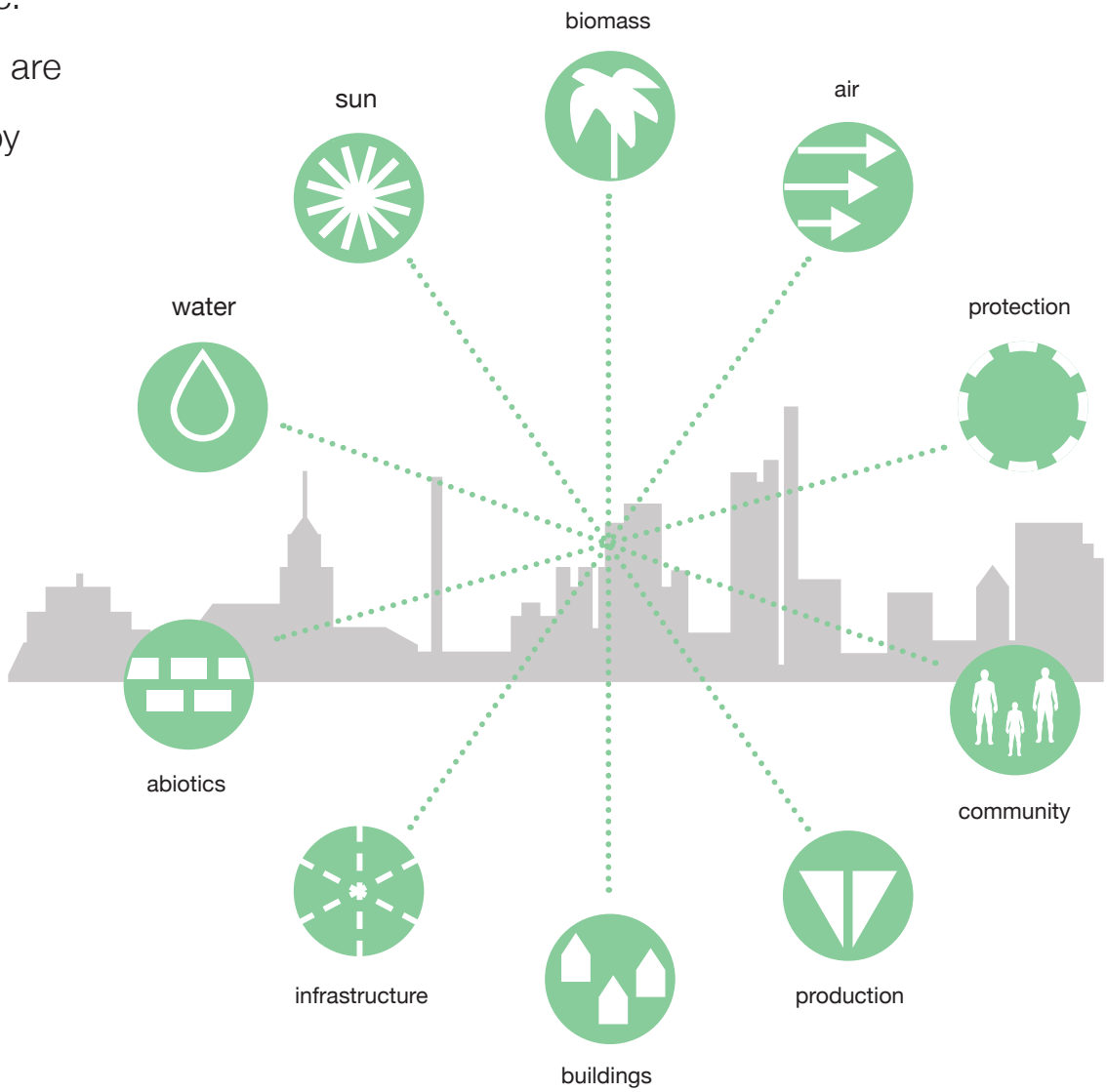
recreation

governance

politics

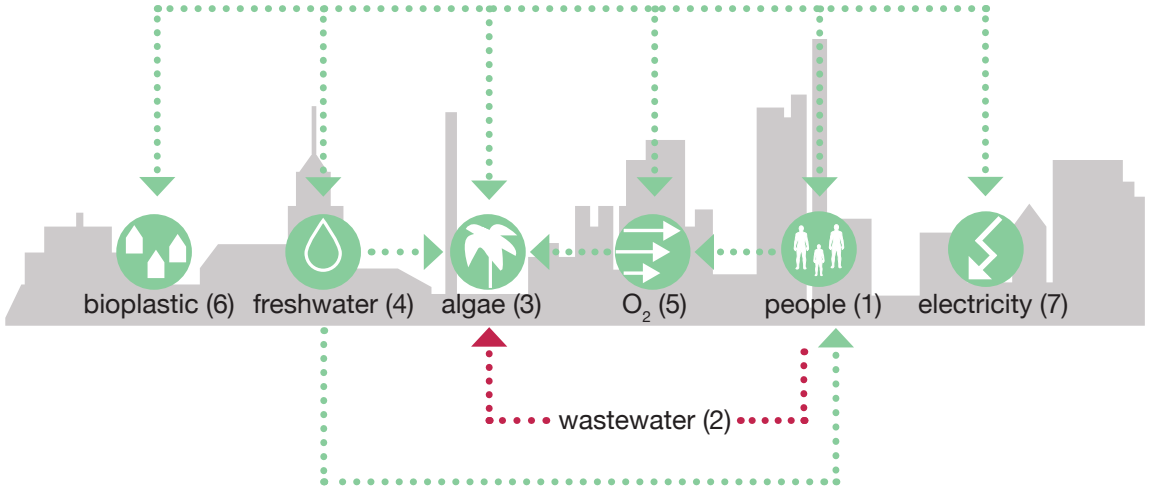
A shift in thinking: Cities as systems

Shift in looking at urbanism not just as a materialised form of shape and design: We understand cities as a holistic network of flows, processes and their interdependence.
In the bigger picture, ecosphere and human sphere are seen here as one system influencing and challenged by urbanism in general.



From consuming to producing cities

System thinking ties together all necessary urban elements, human needs and natural resources in order to create new synergies: From waste to resource. From consumer to collaborator. From degenerating to regenerating cities.



Example synergies:
people (1) produce wastewater (2) which feeds algae (3) which produces freshwater (4), food and O_2 (5) and is a resource for bioplastic (6) and energy.

Productive city visions

Creature Ark: Biosphere Skyscraper

Productive city visions

METHANESCRAPER

The Ultrastructure of the Third City:
DISTRICT 3

Territory of the Third City:

Macrocontext

The macro-context of the analysed region represents the place of juxtaposition of the three 'situations' of the city, its presence and complete absence, manifested in relations of built, inhabited coastal areas of the old and New Belgrade and the 'void' across the river – "Old, New, and Third Belgrade". The results of the research include defined urban and architectural elements of the new city.
Two occupied areas of Belgrade open a discussion of the character of the city's spatial infrastructure, opening the question program types and spatial identity. The most important qualities are relation of the new settlement with formed matrices within the confluence of the Sava into the Danube (Old and Novi Beograd with Zemun) and urban, spatial and visual identity of the new city. Through the analysis of the form and re-examining the significance of the city in its development, the new urban structure is acting like an addition to the two existing cities. Areas of three different cities are shown below:

Microcontext

The initial structure of District 3 is connected to the left bank of the Danube, on wetland east of the Great War Island. Six strategic points, such as the centers of genesis of typical vertical landfills, are the pillars of the new city core. An infrastructure network is developed around them, which generates a further urban plan of the settlement. The district is connected with the rest of the city by the Pancheva Bridge.
Main function of District 3 is a recycling plant and system of vertical landfills. They are located in the middle of the island, on a free zone not far from Vinca landfill, Belgrade's biggest and only landfill. Because of that it is very easy to transport any waste when necessary and a road/water connection can be easily established. Since most of Vinca's waste is not being recycled, it is possible to move unused waste for further processing.

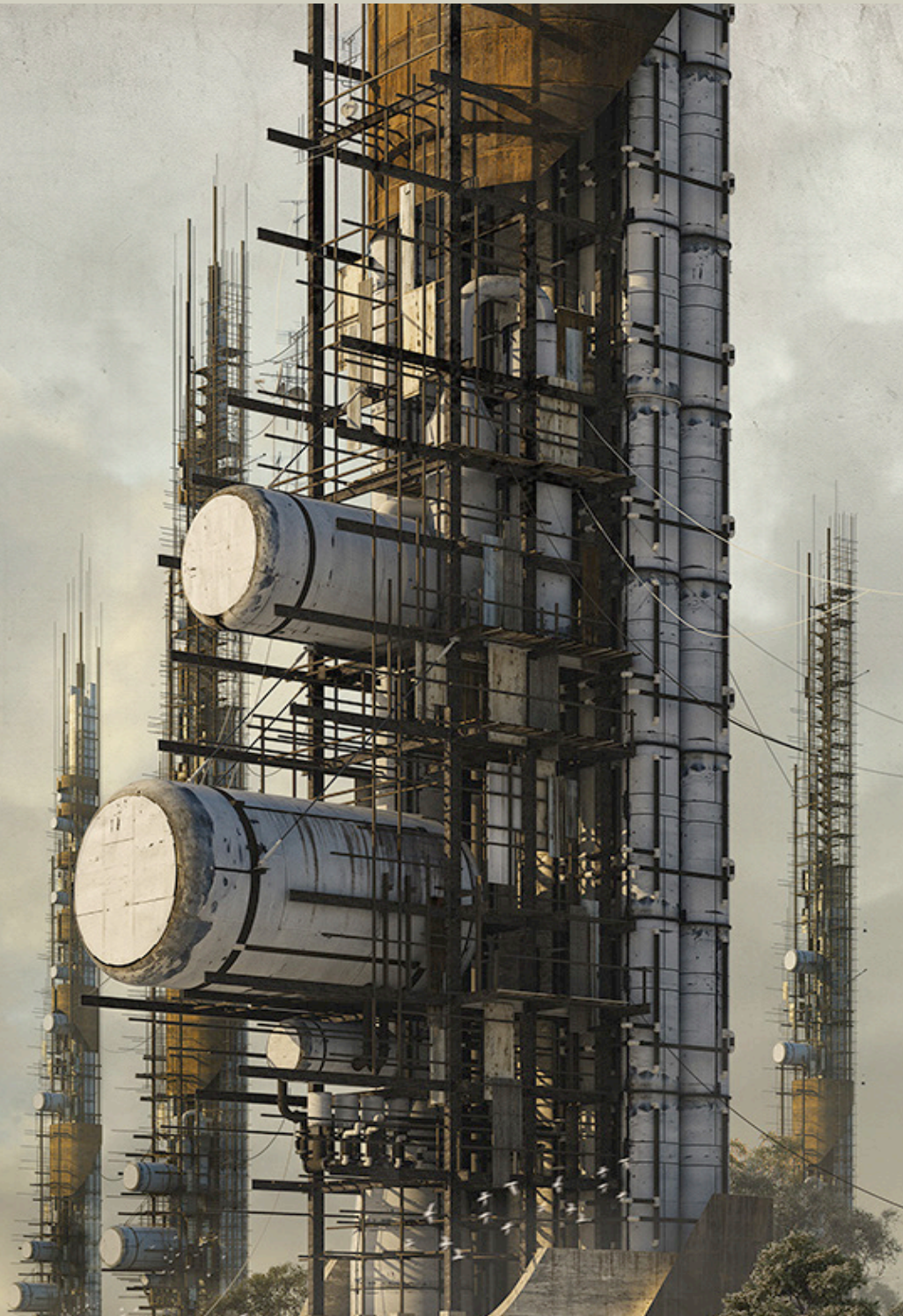
Program

District 3 contains six waste towers (vertical landfills), recycling center, seven temporary concrete pools that serve as a temporary landfill, small harbor, incinerator area, toxic waste area, multiple control rooms and a sorting facility. Vertical landfills are made up of modules, sorted waste is being disposed in vacuumed capsules, then attached to the tower core by cranes. Organic matter that decomposes inside produces methane gas, which is extracted to hanging tanks, then processed and transformed into electrical energy. The initiators and the main work force of the District are the Roma people. The work they could do does not differ much from the jobs that most Roma already know how to do. Roma collectors have been doing the job for decades. Part of the company could be employed in the transport of waste, part of the landfill and part in sorting facility. Since Roma are one of the most marginalised groups in the city with very bad economic state, part of the energy that is produced could be used to power some of their informal settlements.

SORTED WASTE ---> WASTE CAPSULE ---> METHANE TANK ---> CH4 ---> ENERGY ---> SOCIAL GROUPS

Site

The inner area of research is a region concerning river island of Furkanhumac and its surroundings. It is located between Belgrade and Pancheva city, and it is easily accessible. The island can be connected with both wet and dry path. Nearby chemical plant already has a harbor for industrial ships which can be used for easier transport. Nearby highway E-70 makes it easy to distribute waste and other materials to the island. As the center of the isle is predominately tree-free zone, the impact on the environment would be minimal. Main structure is built on the Furkanhumac river island, not far from both Belgrade and city of Pancheva. This seemingly untouched landscape is actually considered secondary industrial zone in the area. Near the island Vinca landfill is located (Belgrade's main landfill), Belgrade's oil refinery, Pancheva oil refinery, many factories, Serbia's biggest plant, Pancheva landfill.



Productive city visions

AIRSCRAPER

Productive city visions

BIOCELL TOWER

Productive city visions

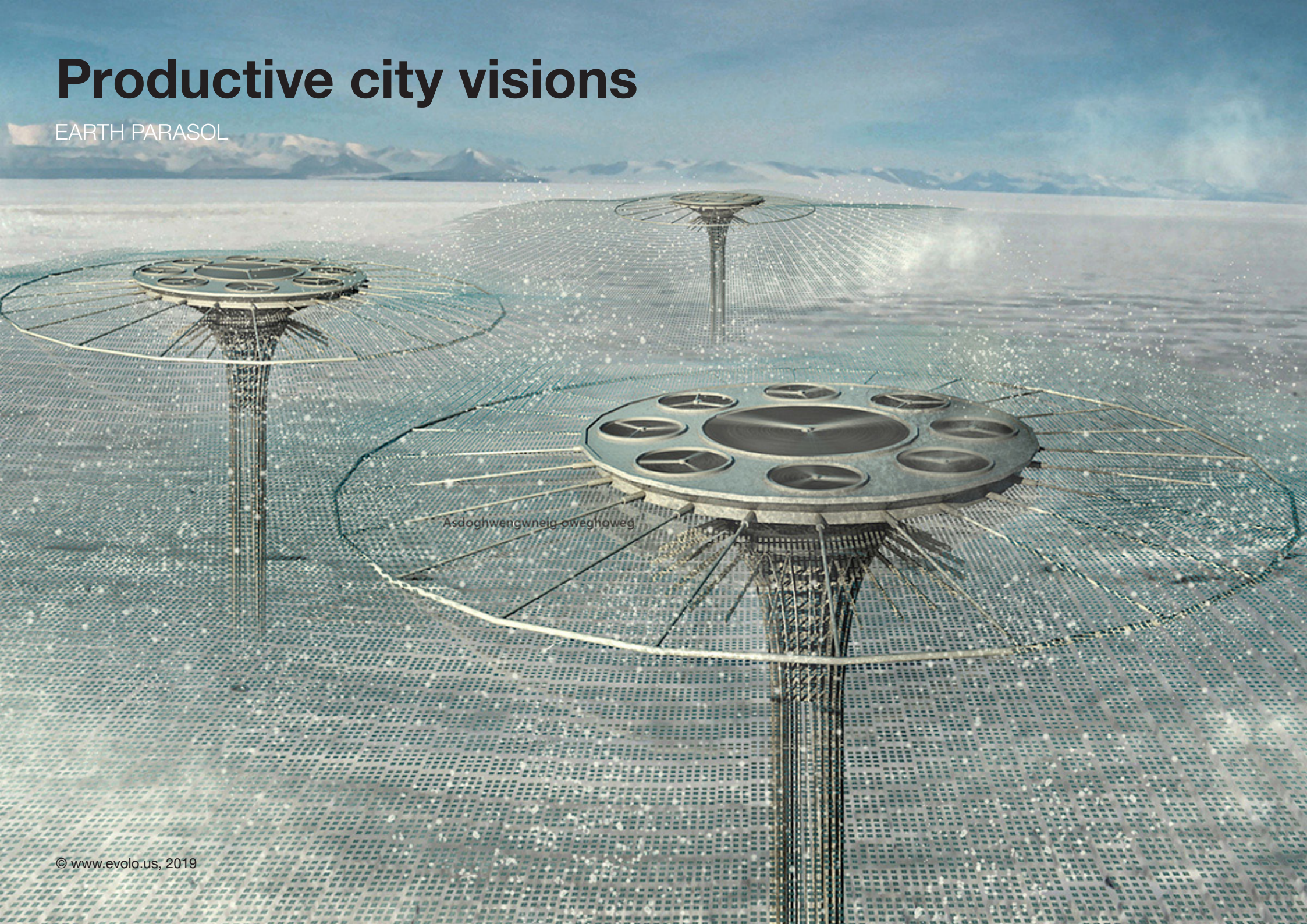
CITY OF NO NATION

Productive city visions

GENE STORE TOWER

Productive city visions

EARTH PARASOL



Productive city visions

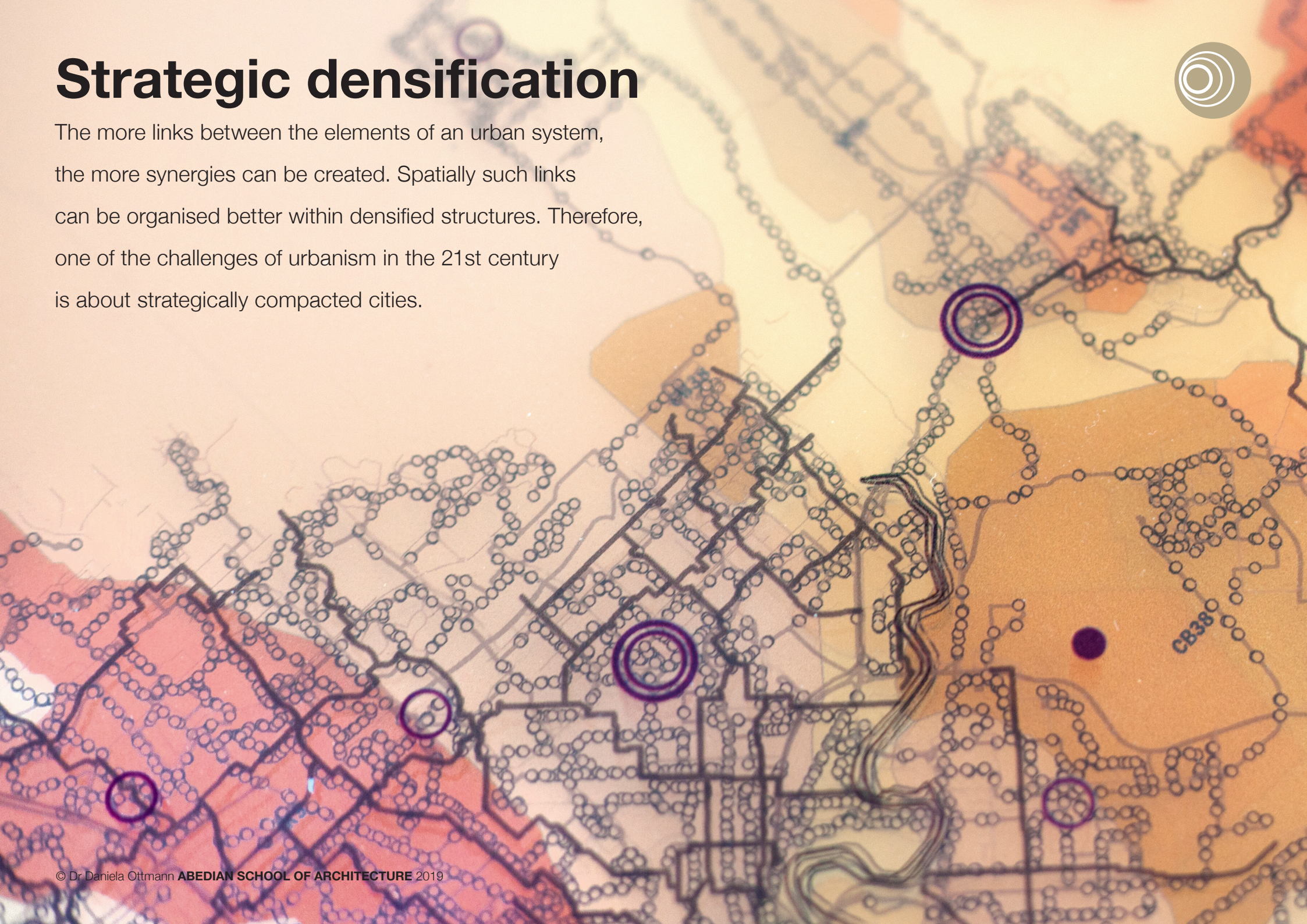
ICE DAM SCRAPER

Productive city visions

TEMPORARY TENT CITY

Strategic densification

The more links between the elements of an urban system, the more synergies can be created. Spatially such links can be organised better within densified structures. Therefore, one of the challenges of urbanism in the 21st century is about strategically compacted cities.



Urban hybrids

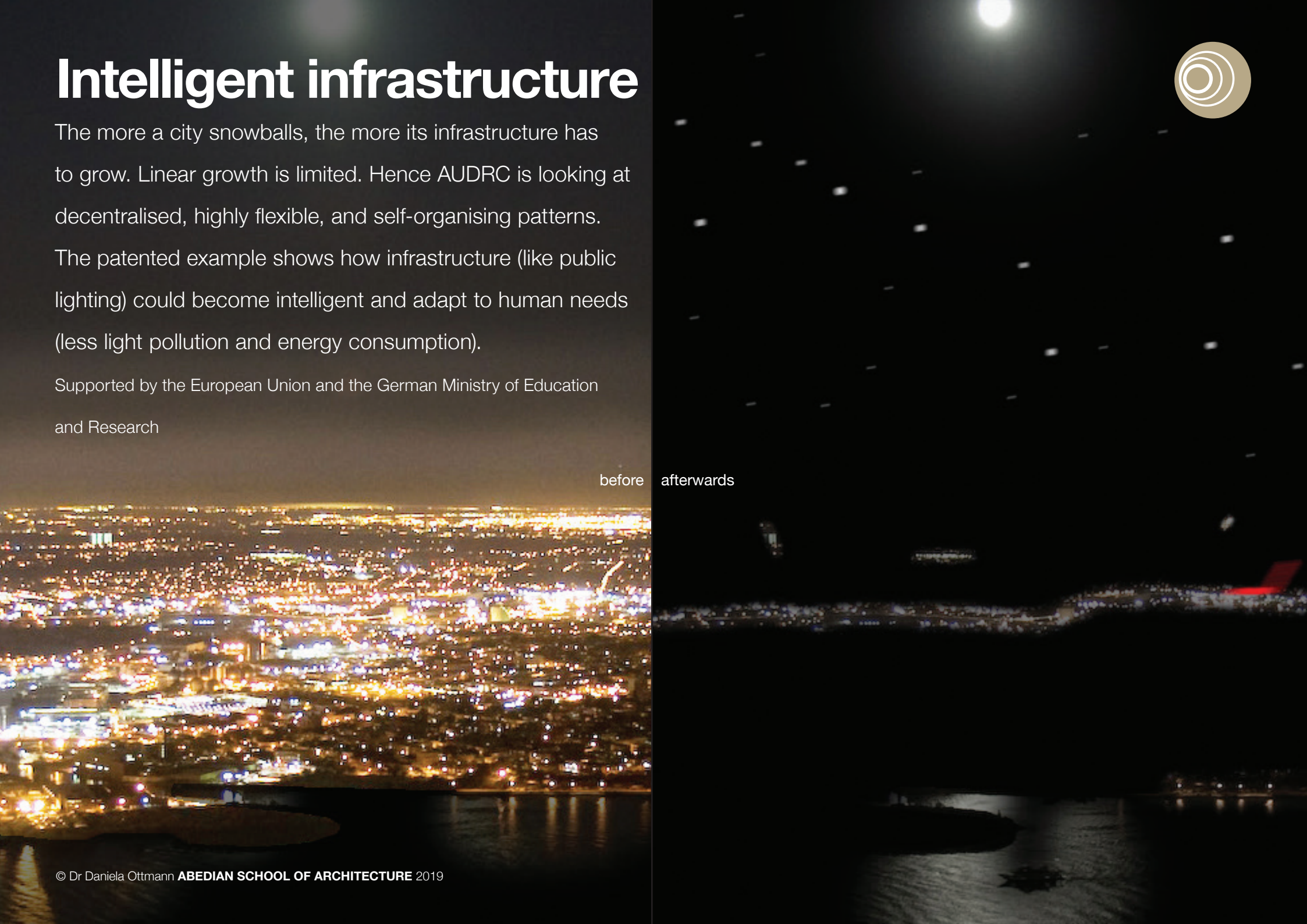
How to merge the best out of two worlds: Urban density and an own home with garden? This focus researches about possibilities of a “Mini Cities” and its consequences in terms of community as well as ecological and economical flows.

Intelligent infrastructure

The more a city snowballs, the more its infrastructure has to grow. Linear growth is limited. Hence AUDRC is looking at decentralised, highly flexible, and self-organising patterns. The patented example shows how infrastructure (like public lighting) could become intelligent and adapt to human needs (less light pollution and energy consumption).

Supported by the European Union and the German Ministry of Education and Research

before afterwards



Modular housing

From industrialisation to mass customisation.

We advocate and develop individual flexibilities in terms of size, standards, materials and financial models to support a social diversity in an urban and architectural scale of future cities.

Supported by the WA Department of Housing

H+ CO-LIVING **FLOORPLAN OPTIONS**

Duplex100
= 2x Simplex60
vertical

Simplex50
= 1/2 Duplex

Simplex100
= 2x Simplex60
horizontal

Duplex200
= 2x Duplex100
horizontal
= 4x Simplex60
horizontal+vertical

Triplex150
= 1xSimplex60 + 1xDuplex100
horizontal

Option A

Option B

Option C


Dupelx100 upper floor


Dupelx100 lower floor


Simplex50 one floor


Simplex100 one floor

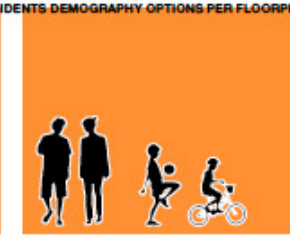

Duplex200 upper floor

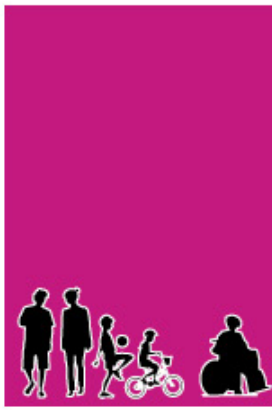

Duplex200 lower floor


Triplex150 upper floor


Triplex150 lower floor

RESIDENTS DEMOGRAPHY OPTIONS PER FLOORPL





Strategic densification

Attention: Densification for the urban poor has its own rules.

Essentially social communities enhance the chance to survive.

Therefore, each change has to incorporate and support entire communities. Top-down planning changes into bottom-up participation processes.

Supported by GIZ / worldbank

before

afterwards

DIY-Cities

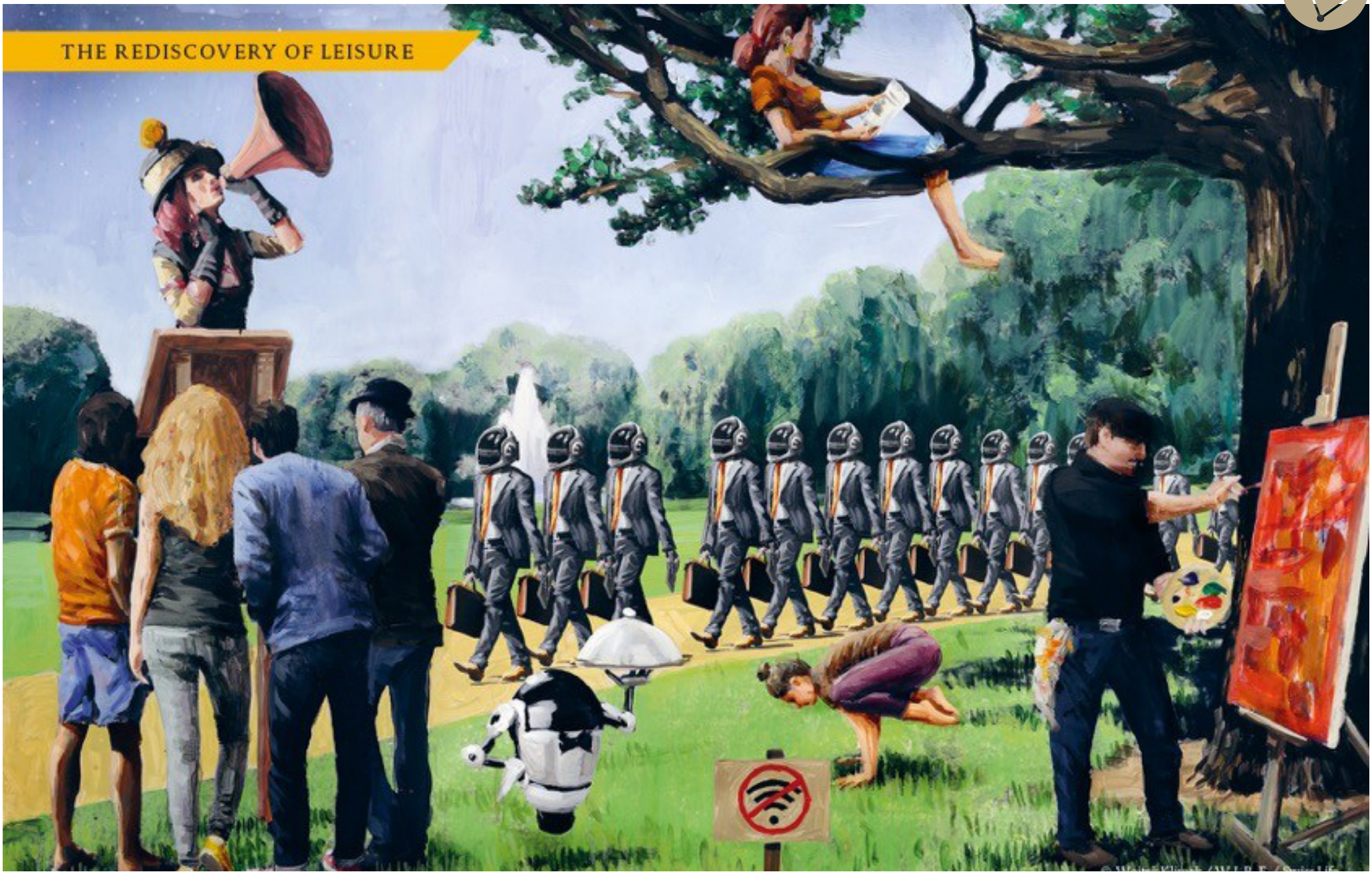
How much planned design is needed? Why shouldn't we just support the energy and ambition of the people of a neighbourhood? The urban layout would demonstrate stills of an urban process.

How will we live?

How will we live?

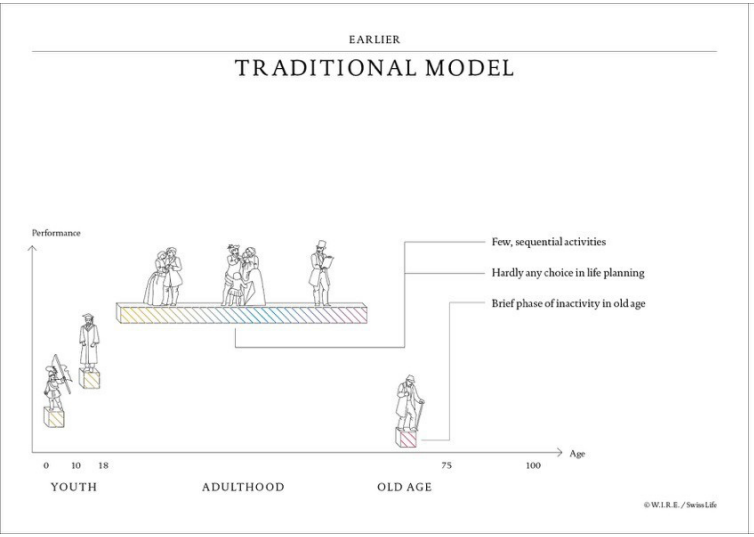
How will we live?

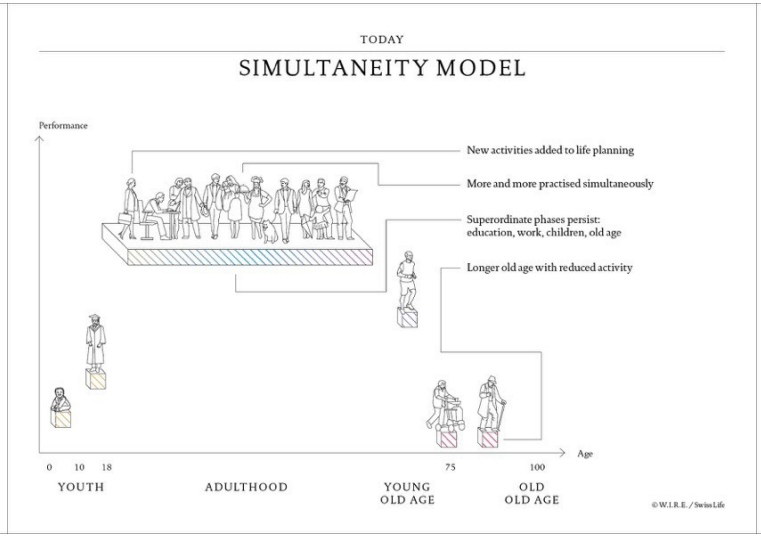
How will we live?

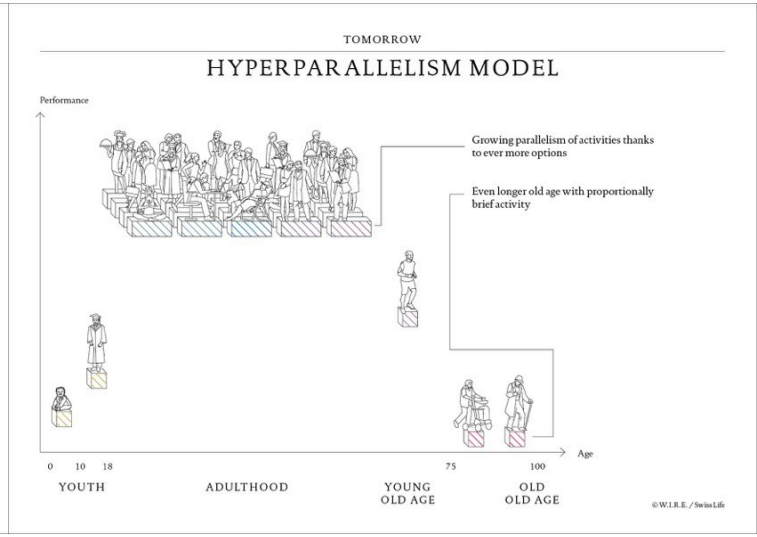


How will we live?

How will we live?







Future Proofing/ System thinking

System thinking has the ability to deal with predictions and design of dynamic urban developments – perhaps the most complex systems humankind has ever built.

The following 5 principles for a better understanding of the complex processes of cities:

Principle 1: Flows

Harmonise natural and urban flows.

Principle 2: Cycles

Link urban and natural flows to urban cycles.

Principle 3: Fractals

From buliding to cities to regions: Differentiate urban scales.

Principle 4: Networks

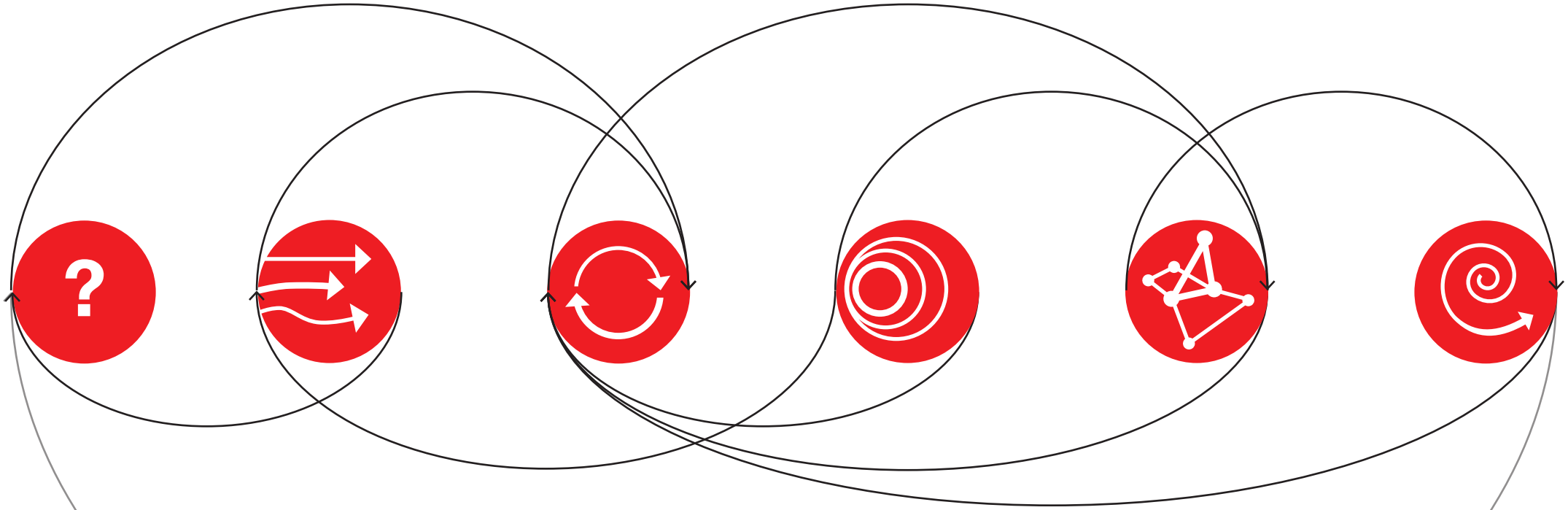
Merge functions of buildings, infrastructure and production.

Principle 5: Adaption

Improve continuously the urban system for its resilience and evolution.

Design thinking

From System Thinking to Design Thinking for any innovation process and ideation.



Understand the problem

Explore and observe

Define all the parameters necessary to solve the problem

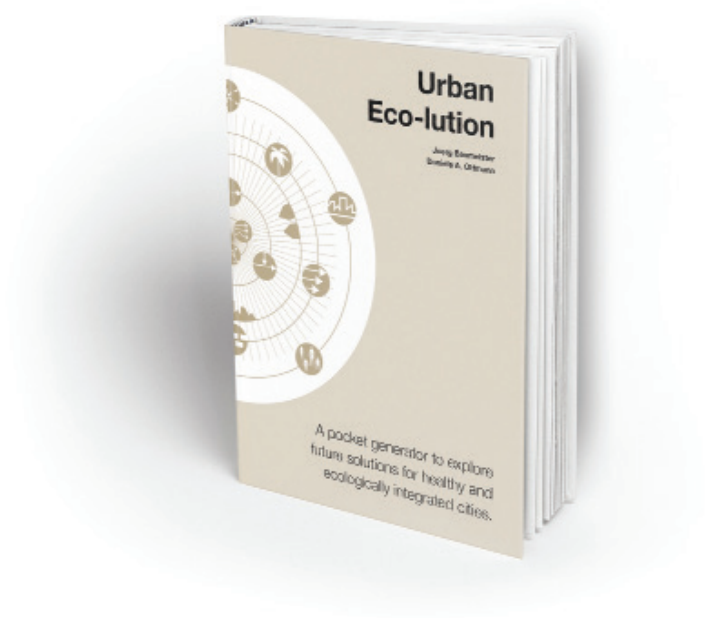
Apply innovation strategies: optimise / transfer / fuse

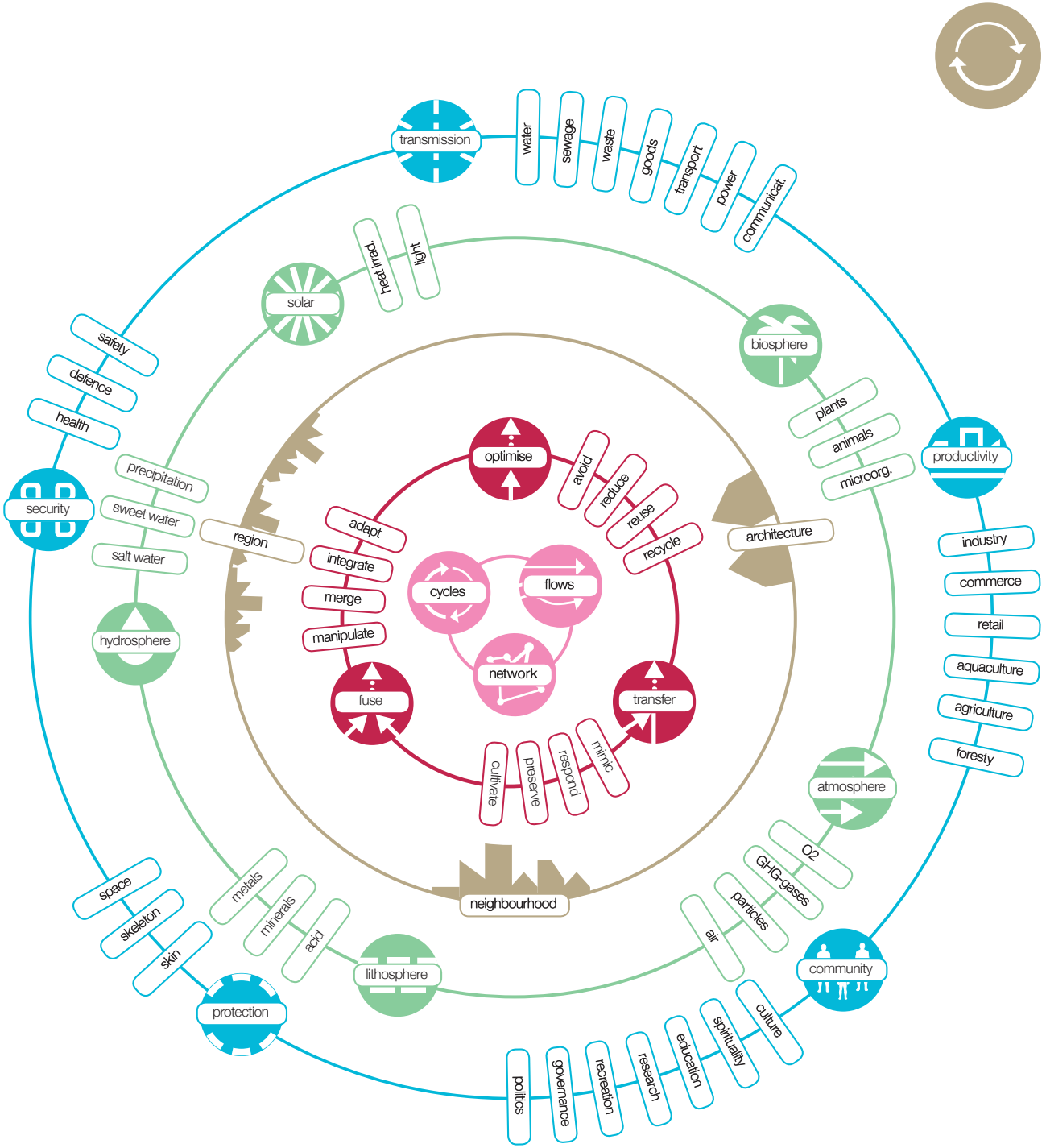
Build ‘models’ of ideas in options

Test ‘models’ against the synthesis parameters

Ecolution

We enable everyone with this new tool to systematically think about and solve emerging urban issues by becoming an inventor for ecologically integrated cities of the future.





Innovative Teaching

Exploring together with students
Eco-Architecture and Urbanism to develop
a common understanding of Urban Planning/Design/Architecture as a system for
ecologically integrated urban developments.
> ABEDIAN SCHOOL OF ARCHITECTURE

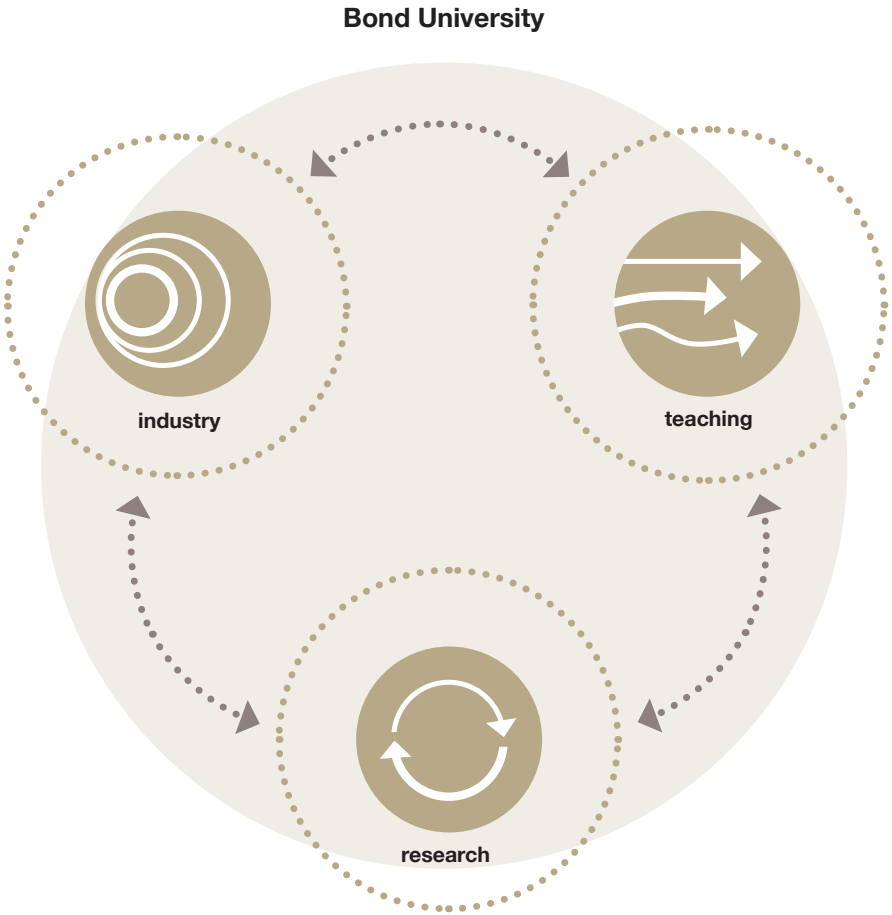
Synergies

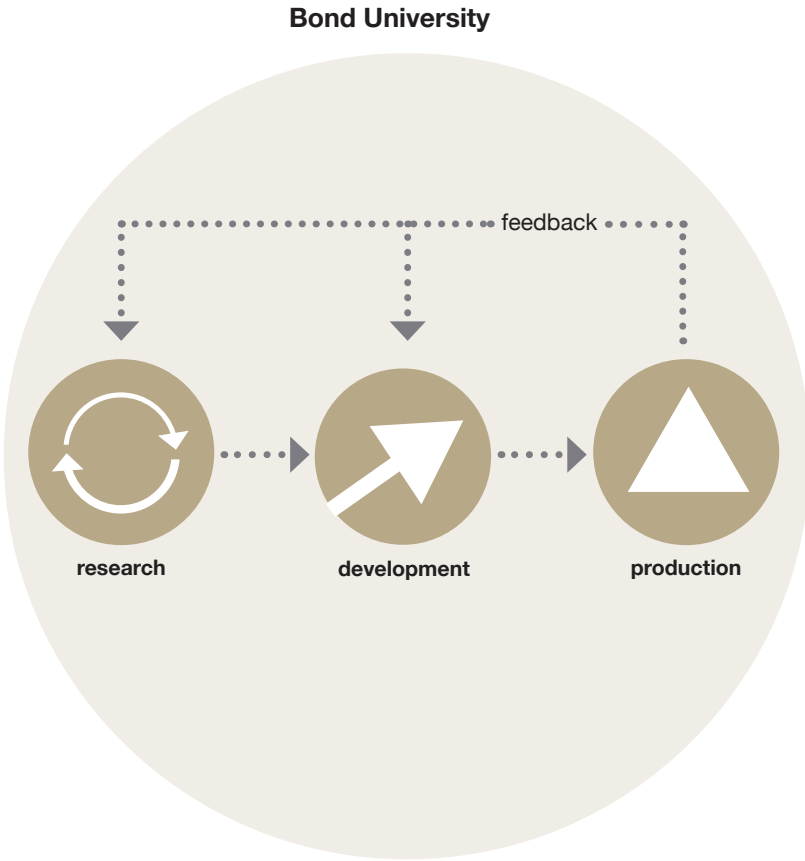
We pool forces of research, teaching and industry (left side).

Due to our diverse professional backgrounds we are in

the outstanding position of covering the entire spectrum from

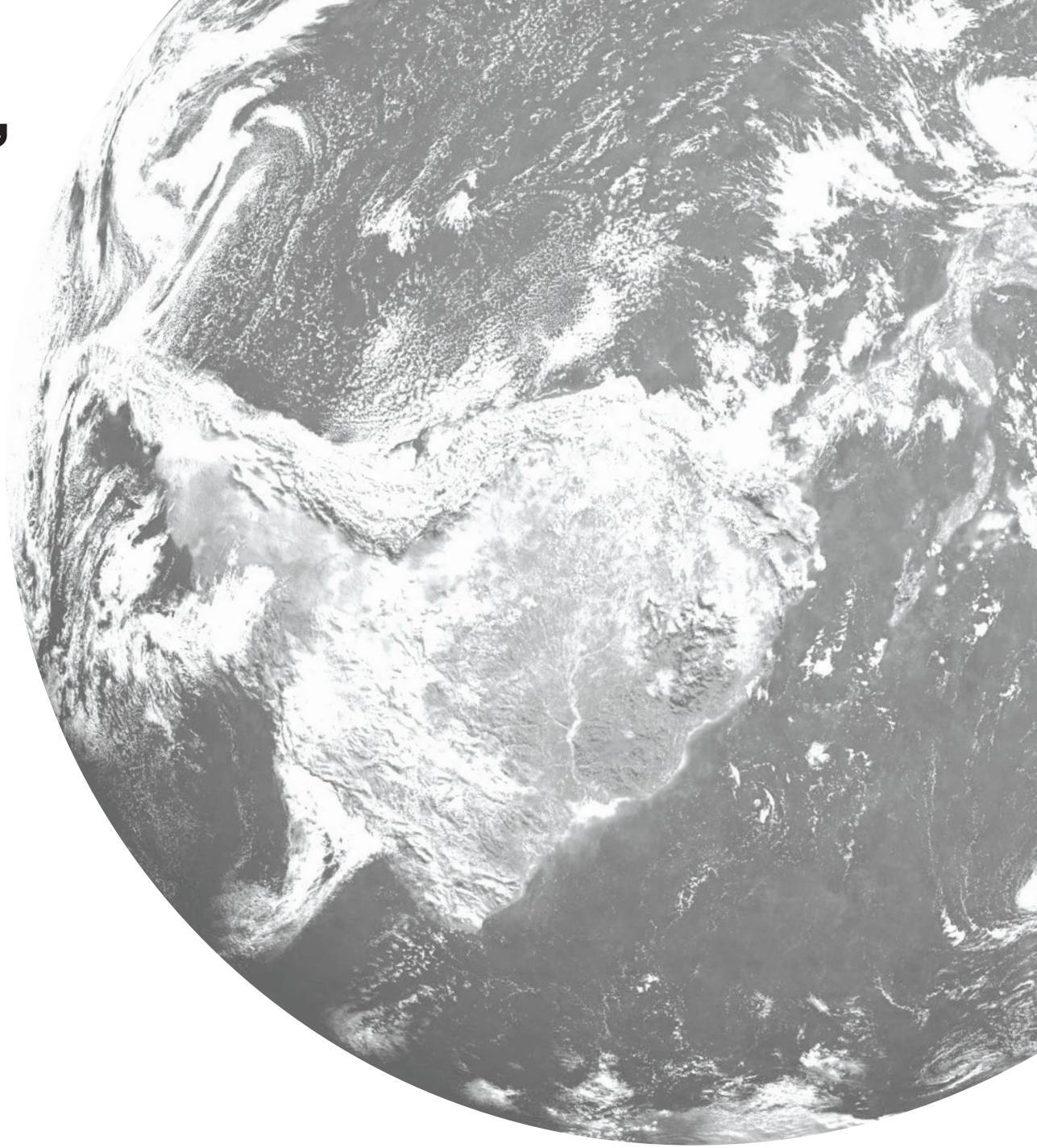
research to development to realisation (right side).





Where is it heading, this unprecedented urban experiment of ours on planet earth?

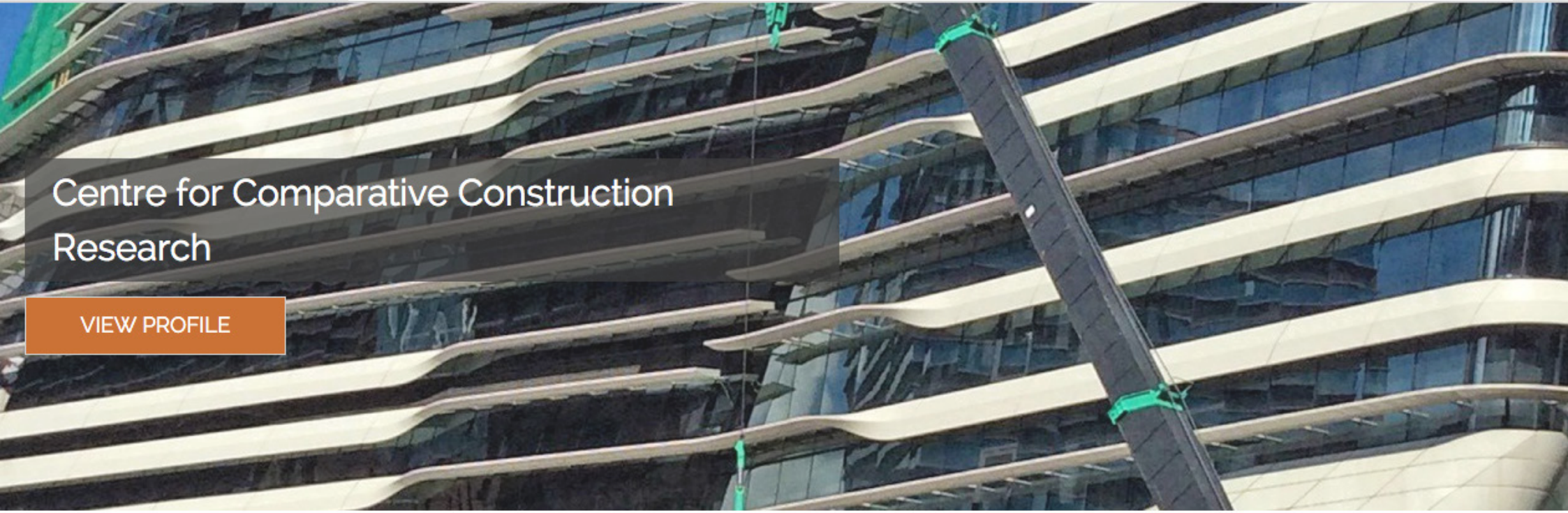
Associate Prof. Dr.-Ing. Daniela A. Ottmann



You and We decide!

Let’s decide together. Get in touch!

BOND UNIVERSITY



Researchers » Research Strengths » Faculty research centres » Centre for Comparative Construction Research

The Centre for Comparative Construction Research (CCCR) currently occupies a niche position by specialising in research on performance and productivity issues of the global construction industry, and other matters relating to comparative construction, such as >

project management effectiveness
building quality
building refurbishment and retrofit
construction productivity
green building design
environmental impact
infrastructure procurement and finance

dottmann@bond.edu.au

BSF discussion /// **Drivers of change**

GLOBALISATION

INDIVIDUALISATION

DEMOCRATISATION

MEDIALISATION

AGING

FLEXIBILISATION

DIGITALISATION

ECONOMISATION

